AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

1. (Currently Amended) A method of processing signals received from an array of sensors comprising ~~the steps of~~:

sampling and digitally converting the received signals ~~and~~;

processing the digitally converted signals to provide an output signal, the processing including filtering the signals using a first adaptive filter ~~arranged to enhance~~ that enhances a target signal of the digitally converted signals and a second adaptive filter ~~arranged to suppress~~ that suppresses an unwanted signal of the digitally converted signals, and processing the filtered signals in ~~the~~ a frequency domain to further suppress the unwanted signal ~~further~~;

determining a direction of arrival of the target signal; and

treating a signal of the received signals as an unwanted signal if the signal has not impinged on the array from within a selected angular range.

Claim 2 (Canceled).

3. (Currently Amended) A method ~~as claimed in claim 2~~ of processing signals received from an array of sensors comprising:

sampling and digitally converting the received signals;

processing the digitally converted signals to provide an output signal, the processing including filtering the signals using a first adaptive filter that enhances a target signal of the digitally converted signals and a second adaptive filter that

suppresses an unwanted signal of the digitally converted signals, and processing the filtered signals in a frequency domain to further suppress the unwanted signal; and

determining a signal energy from the received signals and determining a noise energy from the signal energy;

wherein the signal energy is determined by buffering N/2 samples of the digitized signal into a shift register to form a signal vector of the following form:

$$X_r = \begin{matrix} X(0) \\ X(1) \\ \cdot \\ \cdot \\ \cdot \\ X(J-1) \end{matrix}$$

Where J = N/2; and estimating the signal energy using the following equation:

$$E_r = \frac{1}{(J-2)} \sum_{i=1}^{J-2} X(i)^2 - X(i+1)\, X(i-1)$$

where E_r is the signal energy.

4. (Currently Amended) A method ~~as claimed in claim 2~~ of processing signals received from an array of sensors comprising:

sampling and digitally converting the received signals;

processing the digitally converted signals to provide an output signal, the processing including filtering the signals using a first adaptive filter that enhances a target signal of the digitally converted signals and a second adaptive filter that suppresses an unwanted signal of the digitally converted signals, and processing the filtered signals in a frequency domain to further suppress the unwanted signal; and

determining a signal energy from the received signals and determining a noise energy from the signal energy;

wherein the noise energy is determined by measuring the signal energy E_r of blocks of the digitally converted signals and calculating the noise energy E_n in accordance with

$$E_n^{K+1} = E_n^K + (1-\alpha) E_r^{K+1}$$

Where the superscript K is the block number and α is an empirically chosen weight.

5. (Currently Amended) A method as claimed in claim ~~2~~ 1 further comprising ~~the steps of~~:

determining a signal energy from the received signals and determining a noise energy from the signal energy;

determining a noise threshold from the noise energy; and

updating the noise energy and the noise threshold when the signal energy is below the noise threshold.

6. (Currently Amended) A method as claimed in claim 5 further comprising ~~the step of~~ determining if a target signal is present by comparing the signal energy to a signal threshold.

7. (Currently Amended) A method as claimed in claim 6 further comprising ~~the step of~~ determining the signal threshold from the noise energy and updating the signal threshold when the signal energy is below the noise threshold.

8. (Currently Amended) A method as claimed in claim 5 wherein the noise threshold T_{n1} is determined in accordance with:

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$$T_{n1} = \delta_1 E_n$$

Where δ_1 is an empirically chosen value and E_n is the noise energy.

9. (Previously Presented) A method as claimed in claim ~~5~~ 6 wherein the ~~noise~~ signal threshold T_{n2} is determined in accordance with:

$$T_{n2} = \delta_2 E_n$$

Where δ_2 is an empirically chosen value and E_n is the noise energy.

Claims 10-13 (Canceled).

14. (Currently Amended) A method as claimed in claim ~~11~~ 1 further comprising ~~the step of~~:

processing the signals from two space sensors of the array with a third adaptive filter to determine the direction of arrival; and

calculating a measure of reverberation of the signal from filter weights of the first and third adaptive filters.

15. (Currently Amended) A method as claimed in claim 14 wherein the reverberation measure C_{rv} is calculated in accordance with

$$C_{rv} = \frac{W_{td}{}^T W_{su}}{||W_{td}|\, ||W_{su}||}$$

where T denotes the transpose of a vector, W_{su} is ~~the~~ a filter coefficient of the first filter and W_{td} is ~~the~~ a filter coefficient of the third filter.

16. (Currently Amended) A method as claimed in claim 14 further comprising ~~the step of~~ treating the signal as an unwanted signal ~~if~~ when the reverberation measure indicates a degree of reverberation in excess of a selected value.

Claim 17 (Canceled).

18. (Currently Amended) A method as claimed in claim 1 wherein the first adaptive filter has a plurality of channels, comprising a plurality of difference signal channels, the plurality of channels receiving as input, the digitized signals and providing as output, a sum and at least one difference signal, the difference signal channels including filter elements having corresponding filter weights.

19. (Currently Amended) A method as claimed in claim 18 further comprising the step of calculating a ratio of the energy in the sum and difference channels.

20. (Currently Amended) A method as claimed in claim 19 further comprising the step of treating the signal as including a said target signal if the ratio indicates that the energy in the sum channel is greater than the energy in the difference channels by more than a selected factor.

21. (Currently Amended) A method as claimed in claim 20 further comprising the step of treating the signal as including a said target signal only if the signal energy exceeds a threshold.

22. (Currently Amended) A method as claimed in claim 1 further comprising the step of controlling the operation of the second filter to perform adaptive filtering only when a said target is deemed not to be present.

23. (Currently Amended) A method as claimed in claim 1 wherein the first second adaptive filter has a plurality of channels, comprising a plurality of difference signal channels, the plurality of channels receiving input signals from the first adaptive filter and providing as output, a sum signal received from the first adaptive filter, an error signal and at least one a plurality of difference signal signals, the difference signal channels including further filter elements having corresponding further filter weights.

24. (Currently Amended) A method as claimed in claim 23 further comprising the step of scaling the further filter weights ~~if~~ <u>when</u> the norms of the further filter weights exceed a threshold.

25. (Currently Amended) A method as claimed in claim 23 further comprising the step of combining the sum signal and the error signal to form a single signal S(t) of the form:

$$S(t) = W_1 S_c(t) + W_2 e_c(t)$$

where $S_c(t)$ is the sum signal at time t, $e_c(t)$ is the error signal at time t and W_1 and W_2 are weight values.

26. (Currently Amended) A method as claimed in claim 25 further comprising the step of combining the difference signals to form a single signal.

27. (Currently Amended) A method as claimed in claim 25 further comprising ~~the step of~~ applying a Hanning window to the single ~~signals~~ <u>signal</u>.

28. (Currently Amended) A method as claimed in claim 1 further comprising ~~the step of~~ transforming the filtered signals into two frequency domain signals, a desired signal S_f and an interference signal I_f, processing the transformed signals to provide a gain for the desired signal and transforming the gain modified desired signal back to the time domain to provide an output.

29. (Currently Amended) A method as claimed in claim 28 wherein the processing ~~step~~ comprises ~~the step of~~ forming spectra for the frequency domain signals.

30. (Currently Amended) A method as claimed in claim 29 ~~whererin~~ <u>wherein</u> the spectra are modified spectra P_s, P_i of the desired signal and the interference signal of the form:

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$$P_s = |Real\ (S_f)| + |Imag\ (S_f)| + F(S_f) * r_s$$

$$P_i = |Real\ (I_f)| + |Imag\ (I_f)| + F(I_f) * r_i$$

Where "Real" and "Imag" refer to taking the absolute values of the real and imaginary parts, r_s and r_i are scalars and $F(S_f)$ and $F(I_f)$ denotes a function of S_f and I_f respectively.

31. (Original) A method as claimed in claim 30 wherein the function is a power function.

32. (Currently Amended) A method as claimed in claim 31 wherein the spectra are of the form, ~~where "Conj" denotes the complex conjugate~~:

$$P_i = |Real\ (I_f)| + |Imag\ (I_f)| + (I_f * conj(I_f)) * r_i$$

$$P_s = |Real\ (S_f)| + |Imag\ (S_f)| + (S_f * conj(S_f)) * r_s$$

where "Conj" denotes the complex conjugate.

33. (Currently Amended) A method as claimed in claim 30 wherein the function is a multiplication function.

34. (Currently Amended) A method as claimed in claim 33 wherein the spectra are of the form:

$$P_s = |Real\ (S_f)| + |Imag\ (S_f)| + |Real\ (S_f)| * |Imag\ (S_f)| * r_s$$

$$P_i = |Real\ (I_f)| + |Imag\ (I_f)| + |Real\ (I_f)| * |Imag\ (I_f)| * r_i$$

35. (Currently Amended) A method as claimed in claim 29 wherein the processing ~~step~~ includes ~~the step of~~ warping the signal and interference spectra into a Bark scale to form a corresponding signal and interference Bark spectra.

36. (Currently Amended) A method as claimed in claim 35 wherein the processing ~~step~~ further includes ~~the step of~~ calculating a system noise Bark spectrum.

37. (Currently Amended) A method as claimed in claim 36 further comprising ~~the step of~~ combining the interference Bark spectrum and the system noise Bark spectrum to form a combined noise Bark spectrum.

38. (Original) A method as claimed in claim 37 wherein the combined noise Bark spectrum B_y is of the following form:

$$B_y = \Omega_1 B_i + \Omega_2 B_n$$

where Ω_1 and Ω_2 are weighting values B_i is the interference Bark spectrum and B_n is the system noise Bark spectrum.

39. (Currently Amended) A method as claimed in claim 29 further comprising ~~the step of~~ calculating a signal to noise ratio from the spectra and deriving the gain from the signal to noise ratio.

40. (Currently Amended) A method as claimed in claim 39 further comprising ~~the step of~~ modifying the signal to noise ratio with a scaling factor which gradually increases from a first value, at onset of the signal, to a second value ~~as the signal continues, until the signal ceases at which time~~, wherein the scaling factor is ~~rest~~ reset to the first value after the signal is received.

41. (Original) A method as claimed in claim 40 wherein the scaling factor changes in a plurality of steps.

42. (Previously Presented) A method as claim 40 wherein the scaling factor changes exponentially.

Claims 43-46 (Canceled).